

APPENDIX 2C-3

July 2005 Consolidated Pre-Meeting Comments

Peer Review of Proposed Land Chemical and Other Relevant Indicators for EPA's 2006 Report on the Environment

July 19, 2005

Notice:

Pre-meeting comments were prepared by each consultant individually prior to the meeting. They are preliminary comments only, and are used to help consultants become familiar with the document and charge questions, develop the agenda, and identify key issues for discussion. During the meeting, consultants may expand on or change opinions expressed in their pre-meeting remarks and may introduce additional issues. For these reasons, pre-meeting comments should be regarded as preliminary and do not reflect the final conclusions and recommendations of individual consultants. These pre-meeting comments will be included as an appendix in the meeting summary report, along with other background materials.

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Land Chemical Reviewer Biographies

Kevin Armbrust

State of Mississippi

Dr. Kevin L. Armbrust is the State Chemist for the State of Mississippi, The Director and Chief of the State Chemical Laboratory of Mississippi and an Associate Professor in the Chemistry department at Mississippi State University. He received both his B.S. degree in Environmental Toxicology and his Ph.D. in Agricultural and Environmental Chemistry from the University of California at Davis in 1987 and 1992, respectively. From 1992 to 1998 he was employed by DuPont Agricultural Products where he was responsible for the design, conduct and generation of laboratory and field experiments according to Good Laboratory Practice (GLP) to determine the persistence and fate of pesticides in soil, water, plants and animals in support of their registration and reregistration. These have included aquatic monitoring and runoff, field dissipation, hydrolysis, aqueous and soil photolysis, batch adsorption/desorption, aerobic soil metabolism, water-sediment degradation, and fish bioaccumulation studies. He was an assistant professor in the department of Crop and Soil Sciences at the University of Georgia from 1998 to 2002, prior to his current position in Mississippi. His current research interests include development of modern analytical methods (e.g. GC/MS/MS and HPLC/MS/MS) to measure agricultural and industrial chemicals in environmental matrices, investigations of the transport of pesticides and pharmaceutical products in soil and water, the influence of sunlight on their degradation in soil and water, environmental and biological processes influencing the degradation of organic chemicals, and the environmental impact of pesticides and industrial chemicals.

James Carlisle

Office of Environmental Health Hazard Assessment
California Environmental Protection Agency

Jim is with the Office of Environmental Health Hazard Assessment at the California Environmental Protection Agency, where his responsibilities include oversight of the ecotoxicology program, the development of procedures and criteria for risk assessment at school sites, and the review of risk assessments for contaminated sites. Previous California EPA positions included Staff Toxicologist and Senior Toxicologist positions at the Department of Toxic Substances Control and the Department of Pesticide Regulation. Prior to his employment at the California Environmental Protection Agency, he was a Research Toxicologist at Mobay Chemical Corp. (now Bayer, US) in charge of wildlife toxicology studies in support of product registration under FIFRA. Jim served on the faculties in the Veterinary schools at Louisiana State University and Cornell University. He received his DVM at the University of California at Davis and his Masters Degree in Aquatic Pathobiology at the University of Stirling, Scotland.

Terry Spittler

Cornell University

Department of Horticultural Sciences

Dr. Terry D. Spittler recently retired from Cornell University, retaining his facilities and programs, and remaining as the head of the Cornell Venture Support Laboratories, a unit collaborating with the Cornell Agriculture and Food Technology Venture Center and other start-up organizations requiring analytical support. Dr Spittler was the Chief Chemist of the NYS Feed and Nutrient Control Laboratory (1977 - 1995) and Associate Director and Director of the Cornell Analytical Laboratories (1984 - 1997). During this time he was also the USDA Northeast Regional Director of the IR-4 Pesticide Regulatory Program and Regional Laboratories. As PI on numerous competitive grants during his 28 year tenure at Cornell University, Dr Spittler investigated safety issues in the gleanings of fresh foods for hunger relief, the metabolism and environmental fate of pesticides, human exposure to pesticides, mobilization of mineral metals by acid rain, chemical safety issues and analytical methods development. He is past-Chair of the American Chemical Society, Agrochemicals Division, and has served on numerous EPA and USDA science review panels. In 1997-8 he served two years on the Center for Disease Control's Investigation of Causes for Gulf War Syndrome. Dr Spittler holds a joint appointment as Visiting Fellow in the Department of Horticultural Sciences and the Cornell Center for the Environment. A graduate of SUNY Buffalo (MS-Biochemistry) and SUNY Albany (PhD-Physical Organic Chemistry); he is co-founder of Phytobials, LLC, a company in the field of environmental phytoremediation. Off the clock, Spittler is active in the Geneva (NY) Arts Development Council, Geneva Concerts, Inc., downhill skiing, hunting and is an unrepentant carnivore.

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Comments for Group 1 Indicators

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Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Land Chemical**
Indicator Name: **Fertilizer Applied for Agricultural Purposes**

- 1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating and/or contributing to an overall picture of the trends in chemicals used on land and their effects on human health and the environment.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Ambrust: (4) Fertilizer use in agriculture is still one of the principal uses of chemicals responsible for nutrient loadings into non-target water bodies, and for non-point source loading of nutrients within agricultural watersheds. In fact the heavy use of fertilizer within the Watershed and tributaries of the Mississippi River are still considered to be a causative factor for the “dead-zone” within the Gulf of Mexico. Thus, this is a very appropriate indicator of chemical uses on land.

Carlisle: (3) While this indicator does reflect the trends in chemicals used on land it is only an indirect indicator of their effects on human health and the environment because it does not measure how much of the fertilizer is taken up in the fertilized crops and how much runs off the fertilized fields, which is the real parameter of interest. Changes in management practices (e.g. buffer zones, dikes) as well as increasing yields could offset changes in application patterns.

Spittler: (3) Although focused on large production regions for only the three major crops, the results are representative of production agriculture in other farmed areas where the variations in climate, cultivars and use patterns can still be expected to center around the general observations.

- 2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Ambrust: (3) As stated above, within agriculturally dominated watersheds nutrient loading into non-target water bodies, likely from fertilizer use is still a major source of non-point source pollution. From this standpoint, trends in fertilizer use provide valuable insight into these sources. Mitigating factors that could affect nutrient loading as a result of fertilizer use, such as slow-release formulations and agricultural practices that reduce runoff could reduce the value of

the indicator somewhat, however it still provides important information that should be included in the document.

Carlisle: (3) Graph 063.2 is less useful, although it may be of interest to those who want to know if the fertilizer use is near them.

Spittler: (4) This indicator includes the most significant land application chemical use operations, possibly rivaled only by turf and ornamentals production. In addition, alternative uses of the fertilizer chemicals in the system are so limited that all purchased product can be assumed to eventually be applied in an agricultural operation.

3) To what extent do you think the indicator meets the following indicator definition:

An “indicator” is a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Ambrust: (3) Trends in fertilizer use on a national basis, given the dominance of agricultural land use in the country, draw attention to potential increases or decreases in point and non-point source nutrient loading from agricultural lands. As these are numerical values that provide information on pressures exerted on the environment from specific use on a national scale, they meet the definition of an indicator.

Carlisle: (4)

Spittler: (4) Data collected for one component are readily associated with numerical variables to verify scope and magnitude; i.e., data on N sales or usage in Region Z can be accurately correlated with crop type and acreage in the same region.

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, “important” means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (4)

Carlisle: (3) This indicator only partially meets this criterion because it is only an indirect indicator of runoff. Changes in management practices (e.g. buffer zones, dikes) could offset changes in application patterns.

Spittler: (4)

- b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (3)

Carlisle: (4)

Spittler: (4)

- c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (3)

Carlisle: (4)

Spittler: (3)

- d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (4)

Carlisle: (4)

Spittler: (3)

- e) The data are comparable across time and space, and representative¹ of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

¹ An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

Ambrust: (3)

Carlisle: (3) This indicator only partially meets this criterion because it is based on reporting that covers about half of the annual fertilizer use. See also indicator limitations.

Spittler: (4)

- f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (3)

Carlisle: (4)

Spittler: (4)

Please explain:

Ambrust: Generally, this indicator largely or fully meets all of the indicator criteria. As stated in earlier responses, it provides important trend information on the use of chemicals in the environment that can be responsible for adverse environmental impacts. It is objectively presented from the standpoint of use on agricultural land. While agriculture is unquestionably a large (and arguably the largest) user of fertilizer, there are other uses as well (see comments under question 6) and this caveat should be addressed, at least in a sentence, somewhere in the document. The data comes from The Fertilizer Institute (TFI) and U.S. Department of Agriculture (USDA) sources and is sound and up-to-date. While the farm-specific data is not available to the general public, creating a slight transparency issue, the data is aggregated and fulfills the purpose of showing national trends. On a year-to-year basis, the data are going to usually be comparable as they are encompassing use on crops accounting for the majority of agricultural production in the USA.

Carlisle: See explanations under a) and e)

Spittler: The indicator employs sales, usage, acreage and application data that are non-proprietary, readily shared and rarely subject to misinformation. In addition, product sold can be utilized in numerous rotation, application or crisis strategies w/o compromising the value or usefulness of the fertilizer, or forcing destruction, abandonment or dumping because of unforeseen variation in a given season's production plans.

- 5) Do you have any suggestions for more effective graphic presentation of the data?
If yes, please describe.

Ambrust: The graphical presentation of the data appears adequate. I do not have any further suggestions to improve it.

Carlisle: 063.1: Consider normalizing to acreage, if possible.
063.2: Eliminate data table or at least reduce data to 1 or 2 significant figures.

Spittler: A chart illustrating the per-acre use for each given product type for each major crop, or rotation alternative, in regions where rotations or market constraints drive annual planting strategies, would be useful.

- 6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Ambrust: As stated earlier, the reason this indicator is included is due to the adverse environmental effects of nutrient loading into aquatic ecosystems. The major concern with this indicator is that it focuses entirely on agricultural inputs and may lead a reader (especially a lay reader) to interpret this to mean that only agriculture is responsible for nutrient inputs. While agricultural interests are arguably the major users of fertilizer, these only account for about 85 % of total fertilizer demand (Chemical and Engineering News, April 2000). Approximately 14 % is associated with Professional Lawn Care, Consumer Retail, and Golf courses – all patterns associated with urban/suburban watersheds. While this is only 14 % of total demand, many applications are made in close proximity to impervious surfaces (ie streets, parking lots, etc) and may actually present a higher risk of runoff than agricultural settings. Nutrient loadings from turf runoff, septic systems, and sewage treatment plants often dominate loadings in suburban watersheds. The indicator that EPA is proposing to use is valid, however the above limitation should be noted as a limitation in the discussion.

Carlisle: [no answer provided]

Spittler: Including minor crops would be impossible, of course, but a summary indication of how tree crops and row crops represent the balance of fertilizer chemicals used in cited growing regions would be helpful.

7) Overall, this indicator:

Ambrust: XX Should be included in ROE06 TD with the modifications identified above.

Carlisle: X Should be included in ROE06 TD.

Spittler: X Should be included in ROE06 TD.

Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Land Chemical**
Indicator Name: **Reported Toxic Chemicals in Wastes Released, Treated, Recycled, or Recovered for Energy Use**

- 1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating and/or contributing to an overall picture of the trends in chemicals used on land and their effects on human health and the environment.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Ambrust: (4) Given that TRI reports on toxics produced as a part of the normal manufacturing process, this indicator provides valuable information and, when combined with agricultural fertilizer use, provides a nice picture of the chemicals used on land.

Carlisle: (3) It is appropriate and useful. It may not be 100% adequate due to the limitations noted, in particular the exclusion of a significant industry sector whose numbers and aggregate releases may not be constant over time.

Spittler: (3) There are clearly gaps because of unreporting (ed) units or chemicals, and there does not appear to be any indicator recognition of gross errors deception or fraud. In spite of these shortcomings it is a very valuable indicator.

- 2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Ambrust: (4) While this indicator does not provide any information on effects, it does provide critical information on pressures put on the environment by the manufacturing sector. The discussion of this indicator in the technical document would be strengthened if some mention was made, and any trends could be established for specific chemicals, or chemical classes reported in TRI.

Carlisle: (3) This indicator contributes to the first part of the question – i.e. chemicals used, rather than effects.

Spittler: (4) Because it monitors and measures the effects of the most significant anthropogenic compounds in terms of both magnitude and toxicity entering our environment by design, all components of the indicator are ascribed to geographic or industry specific sectors.

3) To what extent do you think the indicator meets the following indicator definition:

An “indicator” is a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Ambrust: (3) The indicator meets this definition as it provides numerical information on a national basis and draws attention to trends in pressures exerted by chemicals used in or produced by manufacturing processes. The ability of this indicator to meet this definition is diminished somewhat as reporting requirements may be met through estimates of outputs through calculations, rather than actual measurements via monitoring efforts. However trends in data over time qualitatively should still yield valuable insight. It would be most useful if uncertainty measurements or estimates were provided wherever estimation methods or calculations of release are used.

Carlisle: (4)

Spittler: (3) In spite of the latitude in methodology for measuring discharge by four (or more) direct, indirect or speculative means, the regulations do require a quantitative, reproducible basis for the determination of quantity, transformation and destination of reported substances.

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, “important” means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (4)

Carlisle: (4)

Spittler: (4)

- b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (3)

Carlisle: (4)

Spittler: (4)

- c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (3)

Carlisle: (4)

Spittler: (3)

- d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (4)

Carlisle: (4)

Spittler: (4)

- e) The data are comparable across time and space, and representative² of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (2)

² An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

Carlisle: (3) Limitations due to reporting thresholds may mask trends over time. For example small businesses are a growing sector of the economy. It is possible that a growing percentage of all releases come from businesses that are below the reporting threshold.

Spittler: (2)

- f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (3)

Carlisle: (4)

Spittler: (4)

Please explain:

Ambrust: As stated earlier, this indicator provides very valuable information on trends in chemical pressures exerted on the environment by the manufacturing sector and thus answers the initial question posed in this section of the ROE. While objective, the indicator may be prone to bias by a small number of industries with relatively large releases of chemicals reportable under TRI. However this fact does not necessarily diminish the value of the indicator. In reporting these values it will be important to note specific areas of bias in each year of the ROE and make attempts to “break-out” these data as was done in this year of the ROE for the mining sector. Additionally this indicator, and trends associated with this indicator, will be very prone to changes in legal reporting requirements in TRI impacting spatial and temporal comparability of the data. This is illustrated this year in the mining sector where changes in legal reporting requirements have apparently strongly biased the trend data towards a decline. The challenge to EPA will be to make specific note of these biases and provide as complete of an explanation as possible so that a reader may fully understand the limitations of the indicator.

Carlisle: [no answer provided]

Spittler: Because feedstock, systems and products are constantly changing, it is difficult to measure the utilization efficiency of many components and to therefore verify technical improvements. One could suggest a “risk cup” approach whereby reporting requirements are triggered by the product of unit size (# of employees) x quantities x risk (toxicity). Current reporting requirements favor escaping some regulatory oversight by compartmentalizing risky stages as small, independent operations.

- 5) Do you have any suggestions for more effective graphic presentation of the data?
If yes, please describe.

Ambrust: I see a number of places for improvement here. First, the precipitous decline in Figure 338.2 is apparently strongly biased by a court ruling that changed TRI reporting requirements for the mining sector and thus does not reflect actual release data over time (i.e. the data between

years are not comparable). I would suggest removing this figure and providing a more extensive discussion of this industrial sector in the document. The table associated with this figure provides very little information as greater than 99.5 percent of all release is to the land. This fact can also be stated in the text. Additionally, Figure 338.1 was difficult for me to interpret. I generally liked the way information on this indicator was graphically presented in the 2003 ROE technical document. In particular Exhibits 3-13 and 3-14 were particularly valuable. I also feel this indicator would benefit from presentation in Table format of 1) Changed thresholds for PBT chemicals described in the third Indicator limitation and 2) a table of current and specifically new PBT chemicals added to the TRI. This information would “set-the-stage for trend data and subsequent trend analysis that could be ultimately reported in 2009 and 2012 ROE’s.

Carlisle: The trends in releases described in the text are not very obvious on the current bar graph.

The total releases should be shown as a fourth bar segment in 338.1 (dump the line) then itemized in a second graph (338.1a?) where the categories of release can be shown more clearly by changing the scale appropriately.

Spittler: No, these were well conceived considering the complexity of the input.

- 6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Ambrust: A few other observations: There are a few typographical errors that should be corrected: 1) in paragraph 4 on the first page, “categories” should be “category”. In the QA/QC section under T1Q1, the acronym EPCRA should be defined. For T2Q3, the answer provided does not appear to address the question. In T4Q4, an additional statement should be added that changing legal reporting requirements would also influence the trend data. This is implied in the statement provided, but needs to be specifically stated.

Carlisle: There is an extra “systems” in paragraph 1, and “categories” should be singular in paragraph 4.

Paragraph 8 refers to “off-site transfers”. Is this the same as “off-site releases” in 338.1? If so, please use the same term. If not, please explain the difference.

It might be useful to estimate the number of facilities required to file TRI reports and the number not required to file TRI reports for each year to give the reader an idea whether there are any trends in that ratio.

T2Q3: The answer should be “No”.

T4Q3: And would you like to share that insight – i.e. does the variability described impact the conclusions that can be inferred from the data and the utility of the indicator?

T4Q4: Might these gaps mislead a user about fundamental trends in the indicator over space or time period for which data are available?

Spittler: This is an indicator that clearly warrants more attention because of the potential effects of its subject materials, and the potential for unproven or risky practices.

7) Overall, this indicator:

Ambrust: XXX Should be included in ROE06 TD with the modifications identified above.

Carlisle: X Should be included in ROE06 TD.

Spittler: X Should be included in ROE06 TD.

Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Land Chemical**
Indicator Name: **Pesticide Residues in Food**

- 1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating and/or contributing to an overall picture of the trends in chemicals used on land and their effects on human health and the environment.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Ambrust: (4) This indicator provides a very nice picture of the ambient condition of human exposure to pesticide residues in food samples. While it is not a direct indicator of pesticide use, it does provide information on relevant pesticide exposure to humans through use.

Carlisle: (4)

Spittler: (2) The large amounts of excellent dietary exposure data generated in the existing program is extensively compromised as an indicator because of the proscribed preparation protocols that restrict detection and measurement to arbitrary dietary norms.

- 2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Ambrust: (2) While this indicator does provide valuable information of the status of pesticide residues in the human food chain, it really does not make a critical contribution to answering the main question as 1) Detection of pesticide residues in food does not provide any information on trends in actual pesticide use and 2) detection of pesticide residues in food does not provide any direct correlation to toxicological effects in humans and provides absolutely no information on effects in the environment.

Carlisle: (4)

Spittler: (2) The procedures in this indicator barely address the “concentration of chemicals used on land found in the environment”. Most of the residues are left behind, unquantitated, by the efforts to measure only normal dietary intake. The closer to the table that the sampling occurs, the less significant the residue data are to the indicator objectives. In defense of this reality it must be recognized that dietary intake is the objective of the USDA-PDP program. Its usefulness to EPA as an indicator data resource is limited.

3) To what extent do you think the indicator meets the following indicator definition:

An “indicator” is a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Ambrust: (3) Trends in pesticide residues in food ultimately provide long-term information on the ambient condition of exposure of humans to pesticides through the food-chain. While the crops these are measured on vary from year-to-year, the list of pesticides analyzed seems to be current with the most widely used products on the market, and since this data is aggregated and national in scope, it meets the definition on an indicator.

Carlisle: (4)

Spittler: (4) This indicator certainly meets the exposure or human health facets of the definition – hence the “4” – but the data being generated are inappropriate for their role as indicators of ambient distribution.

4) To what extent do you think the indicator meets each of the following indicator criteria:

- a) The indicator makes an important contribution to answering a question for the ROE. (In this context, “important” means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (2)

Carlisle: (4)

Spittler: (1)

- b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (4)

Carlisle: (4)

Spittler: (4)

- c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (4)

Carlisle: (4)

Spittler: (4)

- d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (4)

Carlisle: (4)

Spittler: (3)

- e) The data are comparable across time and space, and representative³ of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (3)

Carlisle: (4)

Spittler: (3)

- f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

³ An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (4)

Carlisle: (4)

Spittler: (3)

Please explain:

Ambrust: Generally this indicator meets all of the above criteria. The overall quality of this data is without question due to the design of the USDA PDP program. However, as stated earlier trends are subject to changes on a year-to-year basis in the crops analyzed which can impact the temporal comparability of the data. Additionally pesticides have been added to the list of analytes in recent years to keep up with new products coming into the market. As stated in question 2 above, while this indicator does provide valuable insight into the ambient condition of pesticide residues in the human food chain, these values and the associated indicator do not provide direct information on the trends in chemical use and the effects on human health or the environment.

Carlisle: [no answer provided]

Spittler: These data meet all criteria for quality, comprehensiveness, reproducibility, etc., all criteria except that of appropriateness for the issue at hand.

5) Do you have any suggestions for more effective graphic presentation of the data?
If yes, please describe.

Ambrust: The graphical presentation in Figures 064-1, 064-2 and 064-3 are very nicely illustrated and adequately reflect the discussion in the associated text. There are a couple of typographical errors in the legend of 064-2 that need to be corrected: "analyzd" should be "analyzed" and in the same sentence, a space needs to be added between "samples" and "for"

Carlisle: A stacked bar graph might work for 064-1, but if the decision is to stay with the lines, then the scale should be expanded by eliminating the unused 60 to 100% sector. Then Y axis only needs to go to 60.

Spittler: No. Well done.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Ambrust: Generally I do not have any comments other than those above. A statement should probably be added in the text of the discussion and in the QA/QC section (T4Q4) that the USDA PDP program does include most of the pesticides currently on the market. When I first read this

section and saw the trend of increasing numbers of “zero pesticides detected” on crops, my first suspicion was that the list of pesticides analyzed in the PDP was not current with the pesticides used in the market place. I had to go into the USDA website and download the current list of analytes they are measuring on crops to discern whether or not this was true. It would assist the reader if this were mentioned in two to three sentences in the text of the discussion of the indicator.

Carlisle: The change in reporting of pesticide metabolites from 2002 to 2003 produced no apparent reduction in the percent of samples that had 2, 3, or 4 or more residues detected. It would be interesting to have some explanation for this unexpected result.

Spittler: If some modifications were made in the sampling and analyses protocols to include uneaten foliage and other matrices to which the chemicals are applied but that are not the consumed fraction, to consider analyzing the Raw Agricultural Commodity rather than only the edible fraction, or to also look at processing fractions, then perhaps, these data could contribute significantly to the question that the indicator was intended to address.

7) Overall, this indicator:

Ambrust: XX Should be included in ROE06 TD.

Carlisle: X Should be included in ROE06 TD.

Spittler: X Should *not* be included in ROE06 TD.

Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Land Chemical**
 Indicator Name: **Pesticide-Resistant Arthropod Species**

- 1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating and/or contributing to an overall picture of the trends in chemicals used on land and their effects on human health and the environment.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Ambrust: (2) This indicator is largely relying on cases of reports of resistance from literature sources rather than a hard systematic investigation of resistance of various species. In addition there are reasons that arthropods could develop resistance other than through continued use (or over-use) of a particular pesticide. The implication of this indicator would be that continued (and increased) use of pesticides would translate into increased incidence of resistance. This is not necessarily true. Additionally, incidence of pesticide resistance in arthropods would only provide potential information on effects caused by use of insecticides and miticides. It would provide virtually no information on herbicides or fungicides, where on a national basis, resistance is a bigger issue.

Carlisle: (3) It is adequate and appropriate. Its usefulness is limited.

Spittler: (1) It relies on an arbitrary recognition (i.e. peer reviewed publications only) of the reporting of resistance development that may or may not have developed as the result of standard agricultural practices. Further, the member(s) of the compound class that elicited the resistance may not be correctly identified.

- 2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not Indicator is important	Indicator is of minor importance	Indicator is important	Indicator is critical

Ambrust: (2) As stated above, the importance of this indicator is diminished, as it is limited only to insecticides. Its value would be greatly increased if it were extended to an aggregate value of

incidence of pesticide resistant species including plants and fungi. In short, the indicator appears to be too narrow in scope.

Carlisle: (2) While it has obvious application to those who need to control pests in crops and other applications, and to those in the pesticide business who have to continue developing new pesticides to try to stay ahead of the pests. It is not clear what it means to the general public. It has limited applicability to the ROE question it is intended to answer.

Spittler: (1) There may sometimes be a negative correlation with pesticide application, as resistance frequently develops when less than recommended rates are used. This also allows for resistance to build in a non-target species that will only be recognized when it emerges as a resistant population in a near by or recently introduced commercial operation.

3) To what extent do you think the indicator meets the following indicator definition:

An “indicator” is a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Ambrust: (2) The indicator is not actually a direct measure of incidence of pesticide resistant arthropod species collected in a systematic manner, but a compilation of reports of incidence in the peer-reviewed literature. As it based solely on these reports, the geographical domain is unspecified. As it is not clear what data may or may not be published in a given year and from any particular location, it is not apparent how any trends in the data could directly relate to the condition of the environment.

Carlisle: (4)

Spittler: (2) An arbitrary 10-fold ratio is specified to meet the resistance threshold definition, but this has no numerical bearing on the quantities being introduced to the reported boundaries of the ecosystem in which the resistance is described. Resistant populations can also inhabit large areas in which there is no significant treatments or host cultivation being conducted, hence no observations.

4) To what extent do you think the indicator meets each of the following indicator criteria:

- a) The indicator makes an important contribution to answering a question for the ROE. (In this context, “important” means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (2)

Carlisle: (2) This indicator has limited applicability to the ROE question it is intended to answer.

Spittler: (1)

- b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (3)

Carlisle: (3) This indicator may not be comparable over time as the number of researchers doing this kind of investigation increases or decreases.

Spittler: (2)

- c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (1)

Carlisle: (3)

Spittler: (1)

- d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (2)

Carlisle: (2) Significant time lag in data.

Spittler: (3)

- e) The data are comparable across time and space, and representative⁴ of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (2)

Carlisle: (2) This indicator may not be comparable over time as the number of researchers doing this kind of investigation increases or decreases

Spittler: (2)

- f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Ambrust: (3)

Carlisle: (4)

Spittler: (3)

Please explain:

Ambrust: The basis of some of these marks is provided in answers to the questions above. While the database of literature was undoubtedly collected in an objective manner, the underlying data in the individual papers is virtually impossible to subject to any quality assurance principals and the manner in which the data was collected is impossible to verify. The entire database is based upon peer-reviewed journal articles. It is difficult to say when a paper will be published in a given year and it is virtually impossible to state how the incidence of when data is reported in the literature may translate into actual trends of resistance in the population of arthropods.

Carlisle: [no answer provided]

Spittler: The MSU reporting group follows their self-proscribed criteria, and may, in fact, trace the course of resistance outbreaks as long as the field reports match their criteria. They overestimate their topic's significance in that resistance is only a routine observation to mush of

⁴ An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

the research community, and does not always merit a peer reviewed airing. Mant data appear in local extension notes that not only fall short of the monitoring group's standards, they may escape their notice entirely.

- 5) Do you have any suggestions for more effective graphic presentation of the data?
If yes, please describe.

Ambrust: If this indicator is to be included in the 2006 ROE, the axis should be labeled in figure 225-1. Additionally, a statement was made in the "What the Data Show" section that the incidence of arthropod pesticide resistance is strongly correlated the cumulative number of pesticide active ingredients registered by the U.S. EPA. Such a graph showing this correlation would make a nice addition to this section and should be added if at all possible.

Carlisle: No.

Spittler: No.

- 6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Ambrust: I do not have any additional comments that have not already been mentioned in prior questions.

Carlisle: More explanation should be provided to help the reader interpret this indicator. Is this cause for concern? Does it mean we are using too much or too many pesticides? Or too little or too few?

T2Q3: The "answer" does not answer the question. In fact there are no established reference points, thresholds or ranges of values that unambiguously reflect the state of the environment. This limits the usefulness of this indicator, because the reader has no idea what is good or bad. I can imagine them asking "Should I be worried about this?"

T4Q1-4: The inability to generalize these data to the areas that are not monitored limits their usefulness.

Spittler: Factors contributing to resistance are not always directly related to the product being applied that is believed to elicit the observation. Besides chemical class resistance, there is recent evidence that resistance may develop to two-gene transgenic crops, formerly believed immune to resistance development, this caused by the proximity of one-gene transgenic varieties.

- 7) Overall, this indicator:

Ambrust: XX Should *not* be included in ROE06 TD.

Carlisle: X Should be included in ROE06 TD as a secondary indicator with the modifications identified above.

Spittler: X Should *not* be included in ROE06 TD.

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Comments for Group 2 Indicators

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Attachment 3: Comment Sheet for Group 2 Indicator

Topic Area: **Land Chemical**
Indicator Name: **Pesticide Poisonings**

1) To what extent do you agree with this statement:

This indicator is appropriate, adequate, and useful (AA&U) for evaluating and/or contributing to an overall picture of the trends in chemicals used on land and their effects on human health and the environment.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Ambrust: (3) Generally this appears to be a good indicator of trends of the effects of pesticides **available-for-use** rather than an effect on human health of pesticides used on land. Since all of these cases are based upon calls to poison control centers it is reasonable to assume they are mostly due to accidental exposure to a pesticide that is readily available, rather than from the actual use of the chemical (i.e. worker exposure).

Carlisle: (4)

Spittler: (1) Pesticide poisoning reports are rarely based on scientific observation, but are initiated by unsolicited calls to Poison Control Centers. Most cases are acute, and therefore less likely to indicate a wide spread condition than to result from a unique event or accident. Chronic pesticide poisonings would be more interesting and relevant, but most chronic poisonings are first observed in a clinical context.

2) To what extent do you agree with this statement:

This indicator makes an important contribution⁵ to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Ambrust: (3) See comments above. This indicator seems to provide more information on the toxicity of pesticides that are available to the general public rather than the toxic effects on people resulting from their use.

⁵ Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Carlisle: (4) This indicator makes an important contribution to answering the specific ROE question it is intended to answer

Spittler: (2) Again, acute poisonings occur as a result of unique, random or accidental events, or as the result of unfortunate exposure to poorly maintained materials. A recognizable pattern rarely exists.

- 3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Ambrust: While I do question how well this indicator specifically addresses the question concerning chemicals used on land, I do feel it provides important data on general human health effects and the relative trends in human toxicity of chemicals that are available to the public. From this standpoint, this indicator should be included in the ROE.

Carlisle: Indicator is straightforward, well presented, and easily understood.

Spittler: Initial reports of poisonings are frequently ascribed to any pesticide operations in the vicinity – chemical class profiling, if you will. Unfortunately, thorough follow up investigations to determine the actual causes are not always conducted in instances where recovery is rapid or only pets, livestock or wildlife are involved.

General Comments for Group 1 and Group 2 Indicators

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Attachment 4: Comment Sheet for General Questions for Group 1 and Group 2 Indicators

Topic Area: **Land Chemical**

- 1) Considering the Group 1 and 2 indicators *collectively*, do any of these indicators clearly seem to be more appropriate, adequate, or useful for evaluating and/or contributing to an overall picture of the trends in chemicals used on land and their effects on human health and the environment than others? Do any seem to be more important than the others for answering the question they are intended to answer? (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators or if it covers an area of diminishing interest environmentally.)

Ambrust: The indicators that make the largest contribution to answering the proposed question are “Fertilizer Applied for Agricultural Purposes” and “Reported Toxic Chemicals in Wastes Released, Treated, Recycled or Recovered for Energy Use” as they provide direct measures of chemical pressures on the environment. Less important to answering the question is “Pesticide Residues in Food”, since it is reporting, essentially an ambient condition and not so much an actual effect. The indicators “Pesticide Resistant Arthropod Species” and “Pesticide Poisonings” really do not directly address the ROE question.

Carlisle: Pesticide-resistant Arthropod Species is less important because it makes a smaller or less critical contribution to answering the question posed than the other indicators

Spittler: Fertilizer applications and waste chemical destinations are the two among the five I considered that have potential for being respectable indicators. This is primarily because the quantities to be considered are known or defined before the distribution data are factored in. the other indicators, pesticide residues, pesticide poisonings and arthropod resistance rely on speculation that the chemicals included in the indicator are the driving force behind the residue or the effects. In some instances they may not be relevant at all, or the final data are more influenced by the protocol than by the environmental fate of the indicator materials.

- 2) Are there any additional *national-level* indicators that make an important contribution to evaluating trends in chemicals used on land and their effects on human health and the environment, but were not proposed for ROE06, that you would recommend? (Proposed indicators should meet the ROE indicator definition and criteria, be national in scale, be of a quality that likely would pass this type of peer review, and have data that are readily available. For any new indicators proposed, provide justification for their inclusion and list references or citations for the associated underlying data sources.)

As you consider this question, ***please read Attachment 5***, which provides the list of land and other indicators presented in ROE03 that EPA does not intend to carry forward to ROE06, along with EPA’s rationale for withdrawing them. If you disagree with EPA’s

rationale and feel any of these indicators should be included in ROE06, please so indicate in your response to this question, along with your rationale for why they should be included. Note: The full text and graphics for the ROE03 indicators can be viewed online at: <http://www.epa.gov/indicators/roe/html/tsd/tsdLand.htm>

Ambrust: While this may be outside of the scope of Land Chemical indicators, I would propose that EPA consider adding the number of NPDES permits granted as an indicator of pressures on watersheds. This would be a direct measure of anthropogenic pressures exerted by man on aquatic ecosystems. Additionally, EPA could show trends in distributions of classes of permits issued (CAFO's; etc) which would show trends in distribution of pressures on aquatic systems over time. The databases are all maintained directly by EPA and therefore should be readily accessible by EPA. Additionally, I concur with EPA's decision to remove the listed indicators included in the ROE 2003 TD. Ultimately it would be nice for pesticides if all states were to have a pesticide use and reporting system similar to the state of California's.

Carlisle: Pesticide use

The rationale for excluding pesticide use is less than fully convincing. Many of the same arguments apply to fertilizer use, yet the latter is included. While I agree that total pounds manufactured or used in any year would be of limited value, data are available to allow reporting usage by categories. This is something people can relate to and are concerned about.

Spittler: Nothing to propose.